sewer pipe
good date

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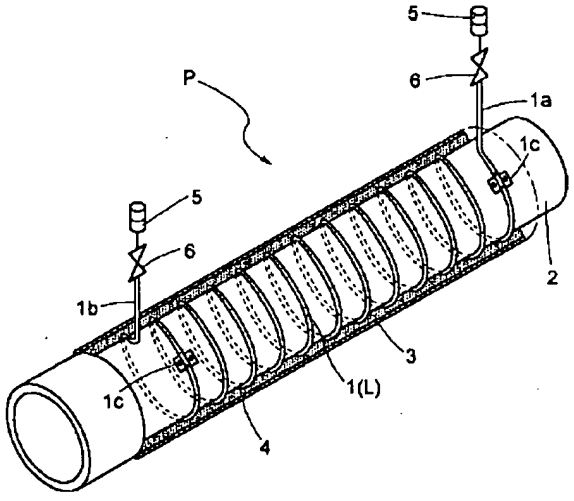
(54)【発明の名称】　下水利用熱源設備構築用の下水用管

(57)【要約】
【課題】　下水利用熱源設備の構築を容易化する。
【解決手段】　下水利用熱源設備の構築に用いる下水用管の構造として、一端から導入した熱媒Ｌを他端から導出する伝熱管１を下水用管本体２の外周面に沿わせてその下水用管本体２に取り付けた構造にする。



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【特許請求の範囲】

【請求項1】　一端から導入した熱媒を他端から導出する伝熱管を下水用管本体の外周面に沿わせてその下水用管本体に取り付けてある下水利用熱源設備構築用の下水用管。

【請求項2】　前記伝熱管を前記下水用管本体に対し螺旋状に巻き付ける状態に取り付けてある請求項1記載の下水利用熱源設備構築用の下水用管。

【請求項3】　前記伝熱管を前記下水用管本体の管芯方向に延びる並列の管列状態で前記下水用管本体に取り付けてある請求項1記載の下水利用熱源設備構築用の下水用管。

【請求項4】　前記伝熱管の一端側管端と他端側管端を、前記下水用管本体の一端側管端部と他端側管端部とに振り分けて配置してある請求項1～3のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項5】　前記伝熱管の一端側管端と他端側管端を、前記下水用管本体の管芯方向において互いに近傍箇所に配置してある請求項1～3のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項6】　前記伝熱管の管端に管継ぎ手を取り付けてある請求項1～5のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項7】　前記伝熱管に可撓性を有する合成樹脂管を用いてある請求項1～6のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項8】　前記下水用管本体の外周面のうち前記伝熱管の不存部分を外部に対して断熱状態にする断熱材を付設してある請求項1～7のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項9】　前記下水用管本体の外周面との間に前記伝熱管を位置させた状態で前記下水用管本体の外周部を覆う保護カバーを付設してある請求項1～8のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項10】　前記伝熱管に熱媒を封入してある請求項1～9のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【請求項11】　前記伝熱管の管内を真空にしてある請求項1～9のいずれか1項に記載の下水利用熱源設備構築用の下水用管。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は下水利用熱源設備の構築に用いる下水用管に関する。

【0002】

【従来の技術】従来、下水を利用した熱源設備としては次の（イ）～（ハ）の形式のものが知られている。

【0003】（イ）図9に示す如く、埋設下水管や下水開渠などの下水路Mから下水Wをポンプにより汲み出し、その汲み出し下水Wを熱交換器Xで熱媒Lと熱交換

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させる形式（例えば、特開平8－21673号公報参照）。

【0004】（ロ）図10や図11に示す如く、熱媒Lを管内通過させる伝熱管Y（すなわち熱交換器）を下水W中に浸漬させる状態で下水路Mやその途中の下水升部M′などに設置する形式。

【0005】（ハ）図12に示す如く、ヒートパイプZの蒸発部aを埋設下水管2′の外面に接触させ、かつ、ヒートパイプZの凝縮部bを融雪対象箇所に位置させる状態にヒートパイプZを設置し、これにより、下水Wの保有熱を融雪対象箇所に汲み上げる方式（例えば、特開平6－136714号公報参照）。

【0006】

【発明が解決しようとする課題】しかし、上記（イ），（ロ）の形式では次のａ，ｂの問題があった。

ａ．下水W中の種々混在物が熱交換器Xの内部流路に付着堆積したり浸漬伝熱管Yに引っ掛かり易く、これに対するメンテナンスや何らかの防御対策が必要になる。

ｂ．種々の腐食性成分を含む下水Wが熱交換器Xの内部や浸漬伝熱管Yに直接に接触するため、熱交換器Xや浸漬伝熱管Yの劣化が早い。

【0007】また、上記（ハ）の形式では次のｃ，ｄの問題があった。

ｃ．ヒートパイプZには、その設置姿勢が蒸発部aを下にした縦姿勢に限られる、また、蒸発部aがパイプの端部位置に限られる、また、実用的な熱運搬効率を得るのにパイプの最大長が限られるといった制約があることから、例えば、下水管2′の施設方向における大きな範囲から下水熱を採取しようとすると、多数のヒートパイプZを各々縦姿勢で下水管施設方向に並列に設置することが必要になるなど、設備施工が難しくなる場合が多く、施設条件によっては設備の設置そのものが無理な場合も多い。

ｄ．ヒートパイプZの上記の如き設置姿勢の制約から、ヒートパイプZの下端部を凝縮部bにして埋設下水管2′に接触させるといった設備形態、すなわち、埋設下水管2′の下水Wを放熱源に利用する設備形態を採ることができない。

【0008】これらの実情に鑑み、本発明の主たる課題は、下水用管に対する合理的な改良により、上記の如き問題を効果的に解消し、特に下水利用熱源設備の構築を大巾に容易化する点にある。

【0009】

【課題を解決するための手段】〔1〕請求項1に係る発明では、下水利用熱源設備の構築に用いる下水用管の構造として、一端から導入した熱媒を他端から導出する伝熱管を下水用管本体の外周面に沿わせてその下水用管本体に取り付けた構造にする。

【0010】つまり、この下水用管を用いた下水利用熱源設備の構築では、上記の如く伝熱管を予め取り付けた

下水用管本体を設備の施設予定地に送り、その施設予定地で、この下水用管本体を用いて下水路を形成するとともに、その下水用管本体に取り付けられている伝熱管に熱媒の給排管を接続して、下水利用熱源設備を構築する。

【００１１】そして、この下水利用熱源設備では、上記伝熱管の管内通過過程で熱媒を伝熱管の管壁及び下水用管本体の管壁を介して下水用管本体内の下水（すなわち、下水用管により形成した下水路の下水）と熱交換させ、これにより、伝熱管に導入する熱媒よりも下水温度が高い場合では、下水の保有熱を熱媒に回収して種々の用途に利用し、また、伝熱管に導入する熱媒よりも下水温度が低い場合では、下水を放熱源に利用して熱媒の担う不要熱を放熱させる。

【００１２】すなわち、上記構造の下水用管を用いた下水利用熱源設備であれば、先述の（イ）～（ハ）の従来形式の設備に比べ、次のＡ～Ｄの効果を得ることができる。

【００１３】Ａ．先の（イ），（ロ）の形式の如く下水中の混在物が熱交換器の内部流路に付着堆積したり浸漬伝熱管に引っ掛かるといったことがないことから、メンテナンスの負担が小さく、また、下水中混在物の付着堆積や引っ掛かりに対する特別な防御対策も不要になる。

【００１４】Ｂ．種々の腐食性成分を含む下水と伝熱管との直接接触による伝熱管の劣化促進がないことから、高い耐用性を得ることができる。

【００１５】Ｃ．一端から導入した熱媒を他端から送出するだけの上記伝熱管については、ヒートパイプの如き種々の制約（先述した設置姿勢の制限など）がないことから、設備施工が容易で、その分、設備コストも安価になり、また、施設条件によって設備の設置そのものが難しくなるといったことを少なくできる。

【００１６】Ｄ．前記の如く下水からの熱回収と下水への放熱とのいずれにも使用できることで、汎用性に優れた下水利用熱源設備となる。

【００１７】そしてまた、これらＡ～Ｄの効果に加え、上記構造の下水用管であれば次のＥ，Ｆの効果を合わせ得ることができる。

【００１８】Ｅ．設備の施設予定地で下水用管（その本体）と伝熱管とを個々に設置施工するのでは、それらの設置に２工程が必要になって施工に要する期間が長くなるとともに施工作業が煩雑化するが、上記の如く下水用管本体に伝熱管を取り付けてあれば、施設予定地での下水用管本体の設置に伴い伝熱管の設置も完了できて、その分、施工期間を短くし得るとともに施工作業を簡略化することができ、この点で、上記したＣ．の設備施工の容易化と相俟って下水利用熱源設備の構築を大巾に容易化することができる。

【００１９】Ｆ．伝熱管を下水用管本体の外周面に沿わせてその下水用管本体に取り付ける構造であるから、下水用管本体には従前の下水用管をほぼそのまま使用することができ、この点、二重管構造にして内管と外管の間に下水と熱媒とのいずれか一方を通過させ、かつ、内管に他方を通過させる熱交換形式や、管内を仕切り壁により２流路に仕切って一方の流路に下水を通過させ、かつ、他方の流路に熱媒を通過させる熱交換形式などに比べ、管の製作に要するコストの上昇を抑止して下水利用熱源設備の設備コストを安価にすることができる。

【００２０】なお、請求項１に係る発明の実施において、伝熱管に通過させる熱媒には、下水からの熱回収の場合、融雪用や凍結防止用などの負荷熱交換器に対して循環供給するブラインや水、温熱源装置としてのヒートポンプの吸熱側熱交換器（冷媒蒸発器）に対して循環供給するブラインや水、温熱源装置としてのヒートポンプにおける蒸発対象冷媒（すなわち、伝熱管をヒートポンプの冷媒蒸発器として機能させる形態）など、種々のものを使用できる。

【００２１】また、下水への放熱の場合、冷却用の負荷熱交換器に対して循環供給するブラインや水、冷熱源装置としてのヒートポンプの放熱側熱交換器（冷媒凝縮器）に対して循環供給するブラインや水、冷熱源装置としてのヒートポンプにおける凝縮対象冷媒（すなわち、伝熱管をヒートポンプの冷媒凝縮器として機能させる形態）など、同様に種々のものを熱媒に使用できる。

【００２２】また、本発明で言う下水とは、一般下水に限られるものではなく、工場排水やトンネルからの湧き水排水などであってもよい。

【００２３】〔２〕請求項２に係る発明では、請求項１に係る発明の実施において、前記伝熱管を前記下水用管本体に対し螺旋状に巻き付ける状態に取り付けた構造にする。

【００２４】つまり、この構造であれば、施設後における下水用管本体内の下水と伝熱管内の通過熱媒との熱交換の伝熱面積及び熱交換時間を、伝熱管の上記螺旋状の巻き付け配置により大きく確保することができ、これにより、下水からの熱回収の場合にはその回収熱量を、また、下水への放熱の場合にはその放熱量を大きく確保することができる。

【００２５】なお、一端から導入した熱媒を他端から送出するだけの伝熱管は、ヒートパイプの如き種々の制約がなく、また、ヒートパイプに比べ加工も容易であることから、伝熱管を螺旋状の巻き付け状態で下水用管本体に取り付けることは容易であり、この構造によって下水用管の製作コストが特に大きく増大することはない。

【００２６】伝熱管を下水用管本体に対し螺旋状に巻き付ける状態に取り付けるには、伝熱管を１列の巻き付け状態にするに限らず、伝熱管を複数列の並列状態で螺旋状に巻き付ける形態を採用してもよい。

【００２７】〔３〕請求項３に係る発明では、請求項１に係る発明の実施において、前記伝熱管を前記下水用管

本体の管芯方向に延びる並列の管列状態で前記下水用管本体に取り付けた構造にする。

【００２８】つまり、この構造であれば、施設後における下水用管本体内の下水と伝熱管内の通過熱媒との熱交換の伝熱面積及び熱交換時間を、伝熱管の下水用管本体管芯方向に延びる上記並列の管列配置により大きく確保することができ、これにより、請求項２に係る発明と同様、下水からの熱回収の場合にはその回収熱量を、また、下水への放熱の場合にはその放熱量を大きく確保することができる。

【００２９】なお、前述の如く、一端から導入した熱媒を他端から送出するだけの伝熱管は、ヒートパイプの如き種々の制約がなく、また、ヒートパイプに比べ加工も容易であることから、伝熱管を下水用管本体の管芯方向に延びる並列の管列状態で下水用管本体に取り付けることは容易であり、この構造によって下水用管の製作コストが特に大きく増大することはない。

【００３０】伝熱管を下水用管本体の管芯方向に延びる並列の管列状態で下水用管本体に取り付けるには、伝熱管の並列の管列を下水用管本体の周方向で等間隔に配置する形態、あるいは、下水用管本体の周方向における特定箇所に対して集積状態に配置する形態のいずれを採用してもよいが、下水路は一般に非満水状態で下水を流すことから、また、下水流量の増減もあることから、このような場合には、施設後における下水用管本体内の下水と伝熱管内の通過熱媒とを効率的に熱交換させる上で、また、下水流量の変化による影響の少ない状態で安定的に熱交換させる上で、伝熱管の並列の管列を下水用管本体の周方向における底部箇所に対して集積状態に配置するのが望ましい。

【００３１】また、並列の管列状態にした伝熱管に対する熱媒通過については、並列の管列に対し熱媒を並列に通過させる形態、あるいは、並列の管列を蛇行状に接続して並列の管列に対し熱媒を直列に通過させる形態、あるいはまた、それら並列通過と直列通過とを組み合わせた形態のいずれを採用してもよい。

【００３２】〔４〕請求項４に係る発明では、請求項１～３のいずれか１項に係る発明の実施において、前記伝熱管の一端側管端と他端側管端を、前記下水用管本体の一端側管端部と他端側管端部とに振り分けて配置した構造にする。

【００３３】つまり、この構造であれば、設備の施設予定地で下水用管本体どうしを順次連結して下水路を形成する際、一方の下水用管本体に取り付けられている伝熱管の一端側管端と、他方の下水用管本体に取り付けられている伝熱管の他端側管端とが、それら下水用管本体どうしの連結箇所で互いに近傍に位置する状態となって、これら取り付け伝熱管どうしの接続を容易に能率良く行なうことができ、これにより、下水用管本体夫々の取り付け伝熱管どうしを直列接続する設備形態を採る場合に、その下水利用熱源設備の構築を一層容易にすることができる。

【００３４】〔５〕請求項５に係る発明では、請求項１～３のいずれか１項に係る発明の実施において、前記伝熱管の一端側管端と他端側管端を、前記下水用管本体の管芯方向において互いに近傍箇所に配置した構造にする。

【００３５】つまり、この構造であれば、設備の施設予定地で下水用管本体に取り付けられている伝熱管に熱媒の給排管を接続する際、その取り付け伝熱管の一端側管端に対する熱媒給排管の供給側管（ないし排出側管）の接続と、その取り付け伝熱管の他端側管端に対する熱媒給排管の排出側管（ないし供給側管）の接続とを、互いに近傍箇所で容易に能率良く行うことができ、これにより、個々の下水用管本体の取り付け伝熱管に熱媒給排管の供給側管及び排出側管を接続する設備形態を採る場合に、その下水利用熱源設備の構築を一層容易にすることができる。

【００３６】〔６〕請求項６に係る発明では、請求項１～５のいずれか１項に係る発明の実施において、前記伝熱管の管端に管継ぎ手を取り付けた構造にする。

【００３７】つまり、この構造であれば、設備の施設予定地で、下水管本体に取り付けられている伝熱管に熱媒給排管を接続したり、下水用管本体夫々の取り付け伝熱管どうしを接続する際、それら接続を伝熱管の管端に予め取り付けられている管継ぎ手を用いて容易に能率良く行なうことができ、この点で、下水利用熱源設備の構築を一層容易にすることができる。

【００３８】〔７〕請求項７に係る発明では、請求項１～６のいずれか１項に係る発明の実施において、前記伝熱管に可撓性を有する合成樹脂管を用いた構造にする。

【００３９】つまり、伝熱管に可撓性を有する合成樹脂管を用いれば、剛管である金属管を伝熱管に用いるに比べ、下水用管本体の外周面に沿わせる状態での下水用管本体に対する伝熱管の取り付けを容易にすることができ、これにより、下水用管の製作コストをより安価にすることができる。

【００４０】また、合成樹脂管は一般に耐食性に優れることから、下水用管本体に取り付けておく伝熱管に合成樹脂管を用いれば、構築する下水利用熱源設備の耐用性も一層高めることができる。

【００４１】〔８〕請求項８に係る発明では、請求項１～７のいずれか１項に係る発明の実施において、前記下水用管本体の外周面のうち前記伝熱管の不存部分を外部に対して断熱状態にする断熱材を付設した構造にする。

【００４２】つまり、この構造であれば、施設後の下水用管本体において、その外周面のうち伝熱管の不存部分から下水熱が外部に放散すること（すなわち、下水保有熱を回収利用する場合では温熱の外部放散、一方、下水を放熱源として利用する場合では冷熱の外部放散）を上

記断熱材により抑止することができて、その分、施設後における下水用管本体内の下水と伝熱管内の通過熱媒との熱交換効率を高めることができ、これにより、下水からの熱回収の場合にはその回収熱量を、また、下水への放熱の場合にはその放熱量を一層大きく確保することができる。

【0043】なお、上記断熱材を付設するにあたっては、下水用管本体の外周面のうち伝熱管の不存部分に対してのみ断熱材を付設する形態、あるいは、下水用管本体の外周面と断熱材との間に伝熱管を挟む状態で伝熱管の存在部分も含めて断熱材を付設する形態のいずれを採用してもよい。

【0044】〔9〕請求項9に係る発明では、請求項1～8のいずれか1項に係る発明の実施において、前記下水用管本体の外周面との間に前記伝熱管を位置させた状態で前記下水用管本体の外周部を覆う保護カバーを付設した構造にする。

【0045】つまり、この構造であれば、伝熱管を取り付けた下水用管本体を設備の施設予定地に運搬する際や、その下水用管本体を設備の施設予定地で掘削溝孔に設置する際などに、取り付け伝熱管を他物との衝突などで損傷することを上記保護カバーにより防止することができ、これにより、伝熱管損傷による施工の遅滞を回避できる点で、下水利用熱源設備の構築を一層容易にすることができる。

【0046】また、上記保護カバーにより設備構築後における伝熱管の劣化も効果的に防止できて、下水利用熱源設備の耐用性も一層高めることができる。

【0047】なお、断熱材を付設する請求項8に係る発明を合わせて実施する場合、下水用管本体の外周面と保護カバーとの間に伝熱管及び断熱材を位置させる状態に保護カバーを付設することにより、断熱材の保護も合わせ図ることができ、また同時に、断熱材をもって保護カバーのへこみ損傷も防止することができる。

【0048】〔10〕請求項10に係る発明では、請求項1～9のいずれか1項に係る発明の実施において、前記伝熱管に熱媒を封入した構造にする。

【0049】つまり、この構造であれば、設備の施設予定地で、下水管本体に取り付けられている伝熱管に熱媒給排管や他の伝熱管を接続してそれら伝熱管に熱媒を満たす際、その伝熱管に予め熱媒が封入されていることで、伝熱管内の空気を抜く作業を不要ないし簡単にすることができ、この点で、下水利用熱源設備の構築を一層容易にすることができる。

【0050】なお、伝熱管に封入しておく熱媒は、設備の施設後において伝熱管に通過させる熱媒と必ずしも同種のものである必要はなく、設備の施設後における通過熱媒との混在が許されるものであれば異種の熱媒であってもよい。

【0051】また、請求項10に係る発明の実施にあたっては、伝熱管の管端部に熱媒封入用のバルブを取り付けておき、これにより、設備の施設予定地で伝熱管を熱媒給排管や他の伝熱管に接続した後に、そのバルブの開き操作をもって、伝熱管を熱媒給排管や他の伝熱管との熱媒充填下の連通状態に容易に移行できるようにするのがよい。

【0052】〔11〕請求項11に係る発明では、請求項1～9のいずれか1項に係る発明の実施において、前記伝熱管の管内を真空にした構造にする。

【0053】つまり、この構造であれば、設備の施設予定地で、下水管本体に取り付けられている伝熱管に熱媒給排管や他の伝熱管を接続してそれら伝熱管に熱媒を満たす際、その伝熱管の管内が予め真空引きされていることで、伝熱管内の空気を抜く作業を不要ないし簡単にすることができ、この点で、請求項10に係る発明と同様に下水利用熱源設備の構築を一層容易にすることができる。

【0054】そして、伝熱管にヒートポンプの蒸発対象冷媒を通過させて伝熱管をヒートポンプの冷媒蒸発器として機能させる設備形態を採る場合や、伝熱管にヒートポンプの凝縮対象冷媒を通過させて伝熱管をヒートポンプの冷媒凝縮器として機能させる設備形態を採る場合には、伝熱管の管内を所要の真空度に保つ必要があることから、このような設備形態を採る場合に特に有効な手段となる。

【0055】なお、請求項11に係る発明の実施にあたっては、請求項10に係る発明と同様、伝熱管の管端部に真空保持用のバルブを取り付けておき、これにより、設備の施設予定地で伝熱管を熱媒給排管や他の伝熱管に接続した後に、このバルブの開き操作をもって、伝熱管を熱媒給排管や他の伝熱管との連通状態に容易に移行できるようにするのがよい。

【0056】

【発明の実施の形態】〔第1実施形態〕図1，図2は下水利用熱源設備の構築に用いる下水用管Pを示し、この下水用管Pは、一端から導入した熱媒Lを他端から送出する伝熱管1を螺旋状に巻き付ける状態で下水用管本体2の外周面に沿わせて下水用管本体2に取り付けた構造にしてあり、また、この下水用管本体2には、その外周面との間に伝熱管1を挟む状態で伝熱管1の存在部分も含めて下水用管本体2の外周面のほぼ全体を被覆する断熱材3、及び、下水用管本体2の外周面との間に伝熱管1及び断熱材3を位置させた状態で下水用管本体2の外周部のほぼ全体を覆う保護カバー4を付設してある。

【0057】伝熱管1の一端側管端1aと他端側管端1bは、下水用管本体2の一端側管端部と他端側管端部とに振り分け配置して保護カバー4の外部へ延出させてあり、また、伝熱管1の両管端1a，1bには管継ぎ手5及び熱媒封入用のバルブ6を取り付け、伝熱管1の管内に熱媒Lを充填した上で、このバルブ6による閉塞をも

って伝熱管１の管内に熱媒Ｌを封入してある。

【００５８】なお、１ｃは伝熱管１を下水用管本体２に取り付ける固定具である。

【００５９】図３は、上記の下水用管Ｐを用いて構築した融雪設備を示し、この融雪設備の構築については、上記の如く伝熱管１を予め取り付けた下水用管本体２を設備の施設予定地に出荷し、その施設予定地において下水路施設用に掘削形成した溝孔７内で下水用管本体２を順次連結することにより下水路Ｍを形成する。

【００６０】また、下水用管本体２どうしの連結箇所において、一方の下水用管本体２に取り付けられている伝熱管１の一端側管端１ａと、他方の下水用管本体２に取り付けられている伝熱管１の他端側管端１ｂとを、それら管端１ａ，１ｂに付設の管継ぎ手５を用いて接続することにより、下水用管本体２夫々の取り付け伝熱管１どうしを直列に接続する。

【００６１】そしてまた、それら伝熱管１の直列接続群における一端側の伝熱管管端１ａと他端側の伝熱管管端１ｂとを、道路や駐車場などの路面下に設置した融雪用熱交換器８に対する熱媒循環路９の往管９ａと復管９ｂとに、それら管端１ａ，１ｂに付設の管継ぎ手５を用いて各別に接続するとともに、下水用管本体２夫々の取り付け伝熱管１における管端１ａ，１ｂの熱媒封入用バルブ６を開いて、各伝熱管１、並びに、熱媒循環路９の往管９ａ及び復管９ｂを熱媒充填下の連通状態にし、その状態で溝孔７を埋め戻す。

【００６２】２′は伝熱管１を取り付けてある上記の下水用管本体２とともに下水路Ｍを形成する通常の下水用管（すなわち、伝熱管１を取り付けていない下水用管本体）である。

【００６３】つまり、この融雪設備では、熱媒循環路９（すなわち、伝熱管１に対する熱媒給排管）を通じて伝熱管１の直列接続群と融雪用熱交換器８との間で循環ポンプ１０により熱媒Ｌ（例えばブライン）を循環させることにより、その熱媒Ｌを各伝熱管１の管内通過過程で伝熱管１の管壁及び下水用管本体２の管壁を介して下水路Ｍの下水Ｗと熱交換させ、この熱交換で熱媒Ｌに回収した下水保有熱を熱媒循環に伴い融雪用熱交換器８で放熱させて道路や駐車場の融雪を行なう。

【００６４】なお、本第１実施形態では、融雪用熱交換器８と伝熱管１との間で熱媒Ｌを循環させる例を示したが、同様の設備構成で路面凍結防止用などの負荷熱交換器と伝熱管１との間で熱媒Ｌを循環させて、下水Ｗからの回収熱により凍結防止を行なうようにしてもよく、また、同様の設備構成で冷却用の負荷熱交換器と伝熱管１との間で熱媒Ｌを循環させて、下水Ｗを放熱源に利用する形態で負荷熱交換器において種々の冷却を行なうようにしてもよい。

【００６５】〔第２実施形態〕図４は、図１，図２に示した前述の下水用管Ｐを用いて構築したヒートポンプ設備を示し、伝熱管１を予め取り付けた下水用管本体２を設備の施設予定地に送って設備を構築する点は第１実施形態と同様である。

【００６６】１１は圧縮式ヒートポンプであり、このヒートポンプ１１は、熱源側熱交換器１２、負荷側熱交換器１３、圧縮機１４、膨張弁１５、四方弁１６を主要構成装置とするヒートポンプ回路（冷凍回路）を備え、四方弁１６による冷媒経路の切り換えにより温熱発生運転と冷熱発生運転との切り換えを行なう。

【００６７】すなわち、四方弁１６による冷媒経路の切り換えにより、温熱発生運転では、熱源側熱交換器１２を冷媒蒸発器として機能させ、かつ、負荷側熱交換器１３を冷媒凝縮器として機能させる。また、冷熱発生運転では逆に、熱源側熱交換器１２を冷媒凝縮器として機能させ、かつ、負荷側熱交換器１３を冷媒蒸発器として機能させる。

【００６８】１７はヒートポンプ１１の熱源側熱交換器１２と伝熱管１の直列接続群との間で循環ポンプ１８により熱源側熱媒Ｌを循環させる熱源側の熱媒循環路（すなわち、伝熱管１に対する熱媒給排管）であり、このヒートポンプ設備では、その構築時に、この熱媒循環路１７の往管１７ａと復管１７ｂとに対して、伝熱管１の直列接続群における一端側の伝熱管管端１ａと他端側の伝熱管管端１ｂとを、それら管端１ａ，１ｂに予め付設の管継ぎ手５を用いて各別に接続する。

【００６９】一方、１９はヒートポンプ１１の負荷側熱交換器１３と負荷装置２０との間で循環ポンプ２１により負荷側熱媒Ｌ′を循環させる負荷側の熱媒循環路である。

【００７０】つまり、このヒートポンプ設備では、温熱需要期（特に冬季）にヒートポンプ１１の温熱発生運転を行なうことにより、伝熱管１の管内通過過程における下水Ｗとの熱交換で下水保有熱を回収した熱源側熱媒Ｌに対して冷媒蒸発器としての熱源側熱交換器１２（すなわち、温熱発生運転における吸熱側熱交換器）を吸熱作用させる形態で、冷媒凝縮器としての負荷側熱交換器１３（すなわち、温熱発生運転における放熱側熱交換器）において温熱を発生させ、この発生温熱を負荷側熱媒Ｌ′の循環をもって負荷装置２０に供給する。

【００７１】また、冷熱需要期（特に夏季）にヒートポンプ１１の冷熱発生運転を行なうことにより、伝熱管１の管内通過過程における下水Ｗとの熱交換で下水Ｗに放熱した熱源側熱媒Ｌに対して冷媒凝縮器としての熱源側熱交換器１２（すなわち、冷熱発生運転における放熱側熱交換器）を放熱作用させる形態で、冷媒蒸発器としての負荷側熱交換器１３（すなわち、冷熱発生運転における吸熱側熱交換器）において冷熱を発生させ、この発生冷熱を負荷側熱媒Ｌ′の循環をもって負荷装置２０に供給する。

【００７２】なお、本第２実施形態では、ヒートポンプ

11の温熱発生運転と冷熱発生運転との切り換えで下水Wからの熱回収と下水Wへの放熱とを選択的に行なうヒートポンプ設備を示したが、温熱発生運転のみを行なうヒートポンプの吸熱側熱交換器と伝熱管1との間で熱媒Lを循環させるようにして、下水Wからの熱回収のみを行なうヒートポンプ設備を構築してもよく、また逆に、冷熱発生運転のみを行なうヒートポンプの放熱側熱交換器と伝熱管1との間で熱媒Lを循環させるようにして、下水Wへの放熱のみを行なうヒートポンプ設備を構築してもよい。

【0073】〔第3実施形態〕図5，図6は、構造を一部変更した下水利用熱源設備構築用の下水用管P′を示し、この下水用管P′では、伝熱管1を下水用管本体2の管芯方向に延びる並列の管列状態で下水用管本体2の外周面に沿わせて下水用管本体2に取り付け、その上で、前述と同様の断熱材3及び保護カバー4を下水用管本体2に付設してある。

【0074】伝熱管1の一端側管端1aと他端側管端1bは、下水用管本体2の管芯方向において互いに近傍箇所に配置して保護カバー4の外部へ延出させてあり、また、伝熱管1の両管端1a，1bには管継ぎ手5及び真空保持用のバルブ6′を取り付け、伝熱管1の管内を真空引きした上で、このバルブ6′による閉塞をもって伝熱管1の管内を真空状態に保ってある。

【0075】なお、並列の管列にした伝熱管1は蛇行状に接続して熱媒Lを直列に通過させる通過させるようにしてある。

【0076】図7は、上記の下水用管P′を用いて構築したヒートポンプ設備を示し、このヒートポンプ設備の構築については、第1及び第2実施形態と同様、上記の如く伝熱管1を予め取り付けた下水用管本体2を設備の施設予定地に出荷し、その施設予定地において下水路施設用に掘削形成した溝孔7内で、伝熱管1を予め取り付けてある下水用管本体2を他の通常の下水用管2′（伝熱管1を取り付けていない下水用管本体）と連結することにより下水路Mを形成する。

【0077】また、その下水用管本体2に取り付けられている伝熱管1の一端側管端1a及び他端側管端1bを、後述のヒートポンプ22から延出した冷媒循環路23（すなわち、伝熱管1に対する熱媒給排管）の往管23aと復管23bとに、それら管端1a，1bに付設の管継ぎ手5を用いて接続し、その後、その取り付け伝熱管1における管端1a，1bの真空保持用バルブ6′を開いて、伝熱管1、並びに、冷媒循環路23の往管23a及び復管23bを冷媒動作に適した真空度の連通状態にし、その状態で溝孔7を埋め戻す。

【0078】ヒートポンプ22は、下水用管本体2の取り付け伝熱管1、負荷側熱交換器24、圧縮機25、膨張弁26、四方弁27を主要構成装置としてヒートポンプ回路（冷凍回路）を構成するものであり、四方弁27による冷媒経路の切り換えにより、下水用管本体2の取り付け伝熱管1を冷媒蒸発器として機能させ、かつ、負荷側熱交換器24を冷媒凝縮器として機能させる温熱発生運転と、これとは逆に、下水用管本体2の取り付け伝熱管1を冷媒凝縮器として機能させ、かつ、負荷側熱交換器24を冷媒蒸発器として機能させる冷熱発生運転との切り換えを行なう。

【0079】28はヒートポンプ22の負荷側熱交換器24と負荷装置29との間で循環ポンプ30により負荷側熱媒L′を循環させる負荷側の熱媒循環路である。

【0080】つまり、このヒートポンプ設備では、温熱需要期（特に冬季）にヒートポンプ22の温熱発生運転を行なうことにより、ヒートポンプ22における蒸発対象冷媒R（すなわち、膨張弁26を通過した冷媒）を伝熱管1の管内通過過程で下水路Mの下水Wと熱交換させて下水保有熱の奪取により蒸発させる形態のヒートポンプ運転を実施し、この運転で冷媒凝縮器としての負荷側熱交換器24で温熱を発生させて、その発生温熱を負荷側熱媒L′の循環により負荷装置29に供給する。

【0081】また、冷熱需要期（特に夏季）にヒートポンプ22の冷熱発生運転を行なうことにより、ヒートポンプ22の凝縮対象冷媒R（すなわち、圧縮機25の吐出冷媒）を伝熱管1の管内通過過程で下水路Mの下水Wと熱交換させて下水Wへの放熱により凝縮させる形態のヒートポンプ運転を実施し、この運転で冷媒蒸発器としての負荷側熱交換器24で冷熱を発生させて、その発生冷熱を負荷側熱媒L′の循環により負荷装置29に供給する。

【0082】なお、本第3実施形態の下水用管P′では、伝熱管1の並列の管列を下水用管本体2の周方向に均等に分散配置にした構造にしたが、これに代え、図8に示す如く、伝熱管1の並列の管列を下水用管本体2の底部側に集積配置するようにしてもよく、また、並列の管列にした伝熱管1に対し熱媒（冷媒R）を直列に通過させるに代えて、伝熱管1の並列の管列に対し熱媒（冷媒R）を並列に通過させる構造にしてもよい。

【0083】また、本第3実施形態では、第2実施形態と同様、ヒートポンプ22の温熱発生運転と冷熱発生運転との切り換えで下水Wからの熱回収と下水Wへの放熱とを選択的に行なうヒートポンプ設備を示したが、温熱発生運転のみを行なうヒートポンプの蒸発対象冷媒Rを伝熱管1に通過させるようにして、下水Wからの熱回収のみを行なうヒートポンプ設備を構築してもよく、また逆に、冷熱発生運転のみを行なうヒートポンプの凝縮対象冷媒Rを伝熱管1に通過させるようにして、下水Wへの放熱のみを行なうヒートポンプ設備を構築してもよい。

【0084】〔別実施形態〕次に別実施形態を列記する。

【0085】下水用管本体2に対する伝熱管1の取り付

けには、固定具による取り付けや、溶接による取り付けを初め、種々の取り付け手段を採用できる。

【００８６】伝熱管１の断面形状は円形、楕円、矩形など、どのような形状であってもよく、また、下水用管本体２との伝熱面積を大きく確保するための片部を備えさせた構造にしてもよい。

【００８７】伝熱管１には、金属管や合成樹脂管など、種々の材質のものを使用できるが、伝熱管１に可撓性を有する合成樹脂管を用いれば、下水用管本体２に対する伝熱管１の取り付けを容易にすることができる。

【００８８】本発明の下水用管を用いて構築する下水利用熱源設備は、下水からの熱回収を目的とする設備、あるいは、下水への放熱を目的とする設備のいずれであってもよく、また、下水からの熱回収を目的とする場合の回収熱の用途や、下水への放熱を目的とする場合の放熱の目的も、夫々、どのようなものであってもよい。

【図面の簡単な説明】

【図１】第１実施形態を示す下水用管の一部破断斜視図

【図２】第１実施形態を示す下水用管の横断面図

【図３】第１実施形態を示す融雪設備の構成図

【図４】第２実施形態を示すヒートポンプ設備の構成図

【図５】第３実施形態を示す下水用管の一部破断斜視図

【図６】第３実施形態を示す下水用管の横断面図

【図７】第３実施形態を示すヒートポンプ設備の構成図

【図８】他の実施形態を示す下水用管の概略斜視図

【図９】従来例を示す設備構成図

【図１０】従来例を示す設備構成図

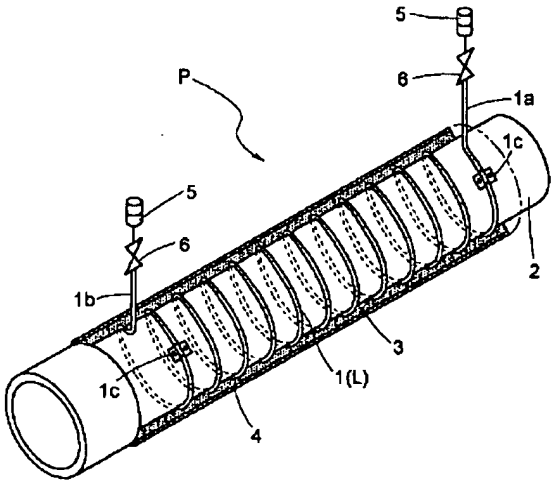
【図１１】従来例を示す設備構成図

【図１２】従来例を示す設備構成図

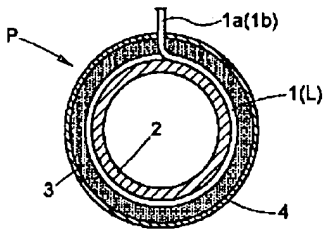
【符号の説明】

1	伝熱管
１ａ，１ｂ	伝熱管の管端
2	下水用管本体
3	断熱材
4	保護カバー
5	管継ぎ手
Ｌ，Ｒ	熱媒

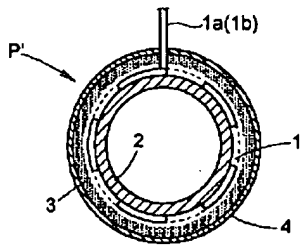
【図１】



【図２】



【図６】



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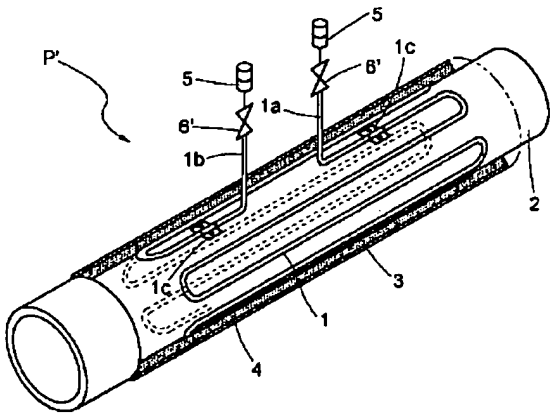

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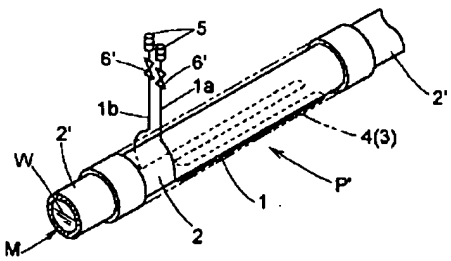
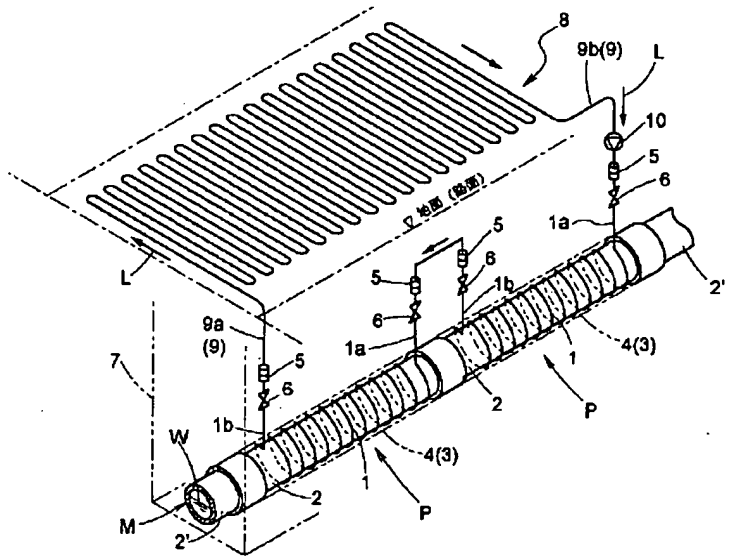


【図3】



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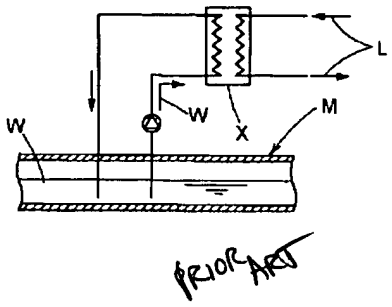

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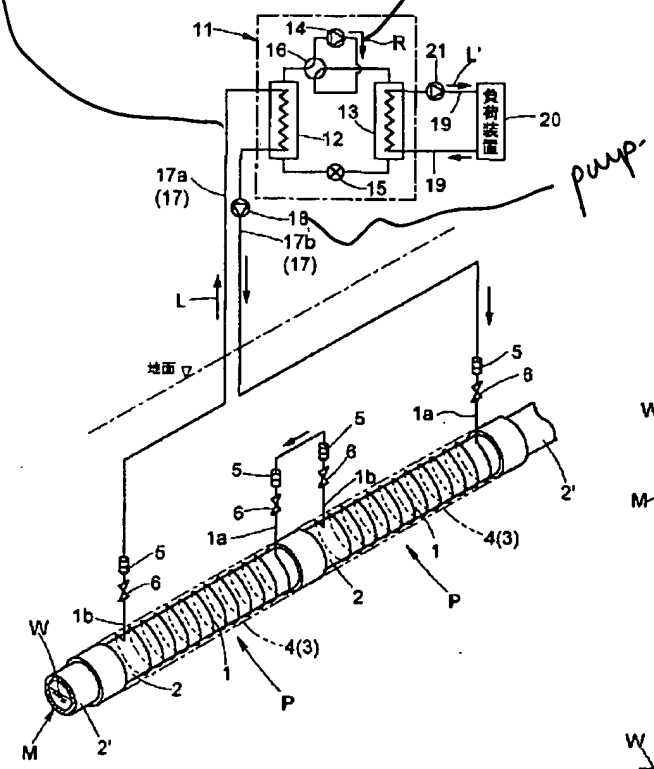
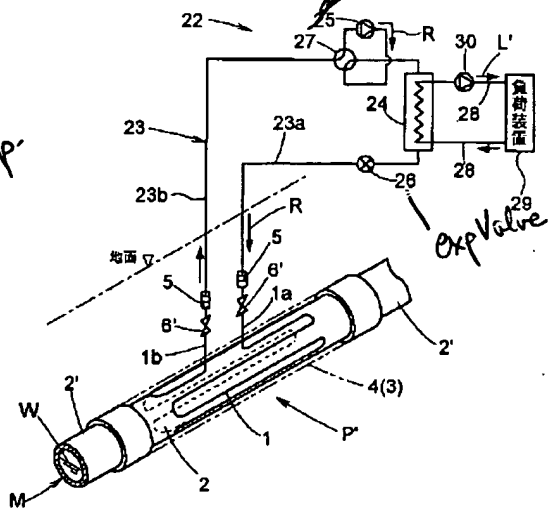


【図7】



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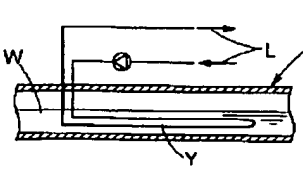
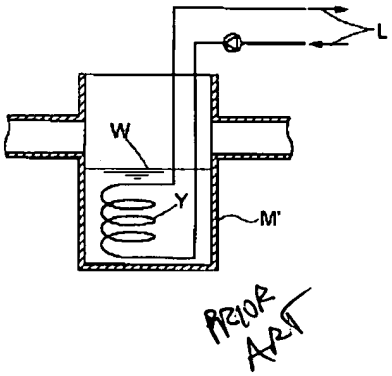
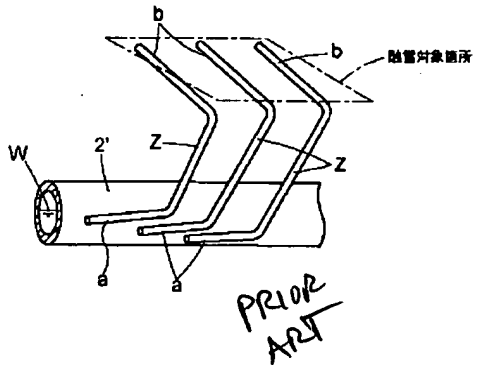


【図11】



【図12】



フロントページの続き

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ABSTRACT:

PROBLEM TO BE SOLVED: To easily construct a sewage-utilizing heat-source facility.

SOLUTION: A heat transfer pipe 1, in which a heating medium L introduced from one end is led out from the other end, is installed to a sewer body 2 along the outer circumferential surface of the sewer body 2 as the structure of the sewer used for building the sewage-utilizing heat-source facility.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to tubing for sewage used for construction of a sewage use heat-source facility.
[0002]
[Description of the Prior Art] Conventionally, as a heat-source facility using sewage, the thing of (**) of a degree - (Ha) a format is known.
[0003] (b) The format of pumping Sewage W out of the sewage ways M, such as a laying-under-the-ground sewer pipe and a sewage open conduit, with a pump, and carrying out heat exchange of the pumping sewage W to a heat carrier L by the heat exchanger X as shown in drawing 9 (for example, refer to JP,8-21673,A).
[0004] (b) The format of installing the heat exhanger tube Y (namely, heat exchanger) to which the tubing secret communication fault of the heat carrier L is carried out in the sewage way M, the intermediate sewage ****M', etc. in the condition of making it immersed into Sewage W as shown in drawing 10 or drawing 11 .
[0005] (c) The method which installs a heat pipe Z in the condition of contacting the evaporator a of a heat pipe Z on the external surface of laying-under-the-ground sewer pipe 2', and locating the condensation section b of a heat pipe Z in the part for a thaw as shown in drawing 12 , and pumps up the potential heat of Sewage W in the part for a thaw by this (for example, refer to JP,6-136714,A).
[0006]
[Problem(s) to be Solved by the Invention] However, there was a problem of the following a and b in the form of the above-mentioned (b) and (b).
a. The maintenance of as opposed to [variously, inclusion carries out adhesion deposition, or tends to be caught in the immersion heat exhanger tube Y in the internal passage of a heat exchanger X, and] this in Sewage W and a certain cure against defense are needed.
b. In order that the sewage W containing various corrosive components may contact directly the interior of a heat exchanger X, and the immersion heat exhanger tube Y, degradation of a heat exchanger X and the immersion heat exhanger tube Y is early.
[0007] Moreover, there was a problem of the following c and d in the form of the above (Ha).
c. Are restricted to the vertical posture to which the installation posture turned Evaporator a to the heat pipe Z down. moreover, from there being constraint that the maximum length of a pipe is restricted to Evaporator a being restricted to the edge location of a pipe, and acquiring the practical heat efficiency of materials handling For example, if it is going to extract sewage heat from the big range in the facility direction of sewer pipe 2' Facility construction becomes difficult in many cases, and the installation of a facility of it being necessary to install many heat pipes Z in juxtaposition in the sewer pipe facility direction with a vertical posture respectively itself etc. is impossible depending on facility conditions in many cases.
d. The facility gestalt of making the lower limit section of a heat pipe Z into the condensation section b, and making laying-under-the-ground sewer pipe 2' contact from constraint of the installation posture like the above of a heat pipe Z, i.e., the facility gestalt which uses the sewage W of laying-under-the-ground sewer pipe 2' for the source of heat dissipation, cannot be taken.
[0008] In view of these actual condition, the main technical problem of this invention is in the point which solves the problem like the above effectively and easy-izes construction of a sewage use heat-source facility sharply especially by rational amelioration to tubing for sewage.
[0009]
[Means for Solving the Problem] [1] Make it the structure which the peripheral face of the body for sewage of tubing was made to meet, and attached in the body for sewage of tubing the heat exhanger tube which derives the heat carrier introduced from the end from the other end as structure of tubing for sewage used for construction of a sewage use

heat-source facility in invention concerning claim 1.
[0010] That is, in construction of the sewage use heat-source facility using this tubing for sewage, while using this body for sewage of tubing for the planned facility site of a facility for the body for sewage of tubing which attached the heat exhanger tube beforehand like the above in delivery and its planned facility site and forming a sewage way in it, thermal feeding-and-discarding tubing is connected to the heat exhanger tube attached in that body for sewage of tubing, and a sewage use heat-source facility is built.
[0011] In this sewage use heat-source facility, heat exchange of the heat carrier is carried out to the sewage within the body for sewage of tubing (namely, sewage of the sewage way formed with tubing for sewage) through the tube wall of a heat exhanger tube, and the tube wall of the body for sewage of tubing in the tubing secret communication fault process of the above-mentioned heat exhanger tube. And by this The unnecessary heat which a heat carrier bears in the source of heat dissipation using sewage is made to radiate heat by the case where sewage temperature is lower than the heat carrier which collects the potential heat of sewage to a heat carrier, and uses for various applications, and is introduced into a heat exhanger tube, by the case where sewage temperature is higher than the heat carrier introduced into a heat exhanger tube.
[0012] That is, if it is the sewage use heat-source facility using tubing for sewage of the above-mentioned structure, the effectiveness of following A-D can be acquired compared with a facility of (**) of point ** - (Ha) the conventional format.
[0013] A. Since it has not said that the inclusion in sewage carries out adhesion deposition, or is caught in an immersion heat exhanger tube like previous (b) and the format of (b) in the internal passage of a heat exchanger, the burden of a maintenance is small and the special cure against defense to adhesion deposition and connection of the inclusion in sewage also becomes unnecessary.
[0014] B. High durability can be acquired from there being no promotion of degradation of the heat exhanger tube by the direct contact to the sewage and the heat exhanger tube containing various corrosive components.
[0015] C. About the above-mentioned heat exhanger tube which sends out the heat carrier introduced from the end from the other end, since there is no various constraint (limit of an installation posture which carried out point **) like a heat pipe, it can lessen that facility construction is easy, and the part and facility cost also become cheap, and the installation of a facility itself becomes difficult according to facility conditions.
[0016] D. By the ability to be used for all of the heat recovery from sewage, and the heat dissipation to sewage, it becomes the sewage use heat-source facility excellent in versatility like the above.
[0017] And in addition to the effectiveness of these A-D, if it is tubing for sewage of the above-mentioned structure, the effectiveness of the following E and F can be doubled again.
[0018] E. Although construction makes it complicated in carrying out installation construction of tubing for sewage (the body), and the heat exhanger tube separately in the planned facility site of a facility while the period which two processes are needed for those installation, and construction takes becomes long If the heat exhanger tube is attached in the body for sewage of tubing like the above, installation of a heat exhanger tube can also be completed with installation of the body for sewage of tubing in the planned facility site, and construction can be simplified while being able to shorten that part and a construction period. At this point Construction of a sewage use heat-source facility can be conjointly easy-ized sharply with easy-ization of the above-mentioned facility construction of C.
[0019] F. Since it is the structure of making the peripheral face of the body for sewage of tubing meeting, and attaching a heat exhanger tube in the body for sewage of tubing Old tubing for sewage can be used for the body for sewage of tubing almost as it is. Make it this point and double pipe structure, and either of sewage and a heat carrier is passed between an inner tube and an outer tube. And a batch makes 2 passage pass sewage through the inside of the heat exchange format of making an inner tube passing through another side, and tubing, to one passage with a bridgewall. And the rise of the cost which manufacture of tubing takes can be inhibited compared with the heat exchange format of making the passage of another side passing a heat carrier etc., and facility cost of a sewage use heat-source facility can be made cheap.
[0020] in addition, in implementation of invention concerning claim 1, to the heat carrier which a heat exhanger tube is made to pass Brine and water which carry out circulation supply to the load heat exchangers the object for thaws, for anti-freeze, etc. in the case of the heat recovery from sewage, Various things, such as a refrigerant for evaporation (namely, gestalt as which a heat exhanger tube is operated as a refrigerant evaporator of heat pump) in the heat pump as the brine which carries out circulation supply to the endoergic side heat exchanger (refrigerant evaporator) of the heat pump as source equipment of warm temperature, water, and source equipment of warm temperature, can be used.
[0021] moreover, the refrigerant for condensation (namely, gestalt as which a heat exhanger tube is operated as a refrigerant condenser of heat pump) in the heat pump as the brine which carries out circulation supply to the load heat exchanger for cooling in the heat dissipation to sewage, water, the brine which carries out circulation supply to the heat-dissipation side heat exchanger (refrigerant condenser) of the heat pump as heat sink equipment and water, and heat sink equipment etc. -- various things can be similarly used for a heat carrier.

[0022] Moreover, the sewage said by this invention may not be restricted to common sewage, may spring from industrial liquid waste or a tunnel, and may be water wastewater etc.
[0023] [2] Make it the structure attached in the condition of twisting said heat exhanger tube spirally to said body for sewage of tubing in implementation of invention concerning claim 1 in invention concerning claim 2.
[0024] That is, if it is this structure, the shape of an above-mentioned spiral of a heat exhanger tube can twist the heating area and heat exchange time amount of heat exchange of the sewage within the body for sewage of tubing after a facility, and the passage heat carrier in a heat exhanger tube, they can be greatly secured by arrangement, thereby, in the case of the heat recovery from sewage, that recovery heating value can be secured, and, in the heat dissipation to sewage, that heat release can be secured greatly.
[0025] In addition, only the heat exhanger tube which sends out the heat carrier introduced from the end from the other end does not have the various constraint like a heat pipe, and since processing is also easy compared with a heat pipe, the spiral thing which it twists and is attached in the body for sewage of tubing in the condition is easy, and the manufacture cost of tubing for sewage does not increase a heat exhanger tube greatly especially according to this structure.
[0026] In order to attach in the condition of twisting a heat exhanger tube spirally to the body for sewage of tubing, it may not restrict for one train's twisting a heat exhanger tube and changing it into a condition, but the gestalt which twists a heat exhanger tube spirally in the state of juxtaposition of two or more trains may be adopted.
[0027] [3] Make it the structure which attached said heat exhanger tube in said body for sewage of tubing by the tubing seriate voice of the juxtaposition prolonged in the direction of a tube core of said body for sewage of tubing in implementation of invention concerning claim 1 in invention concerning claim 3.
[0028] If it is this structure, that is, the heating area and heat exchange time amount of heat exchange of the sewage within the body for sewage of tubing after a facility, and the passage heat carrier in a heat exhanger tube It is greatly securable with **** arrangement of the above-mentioned juxtaposition prolonged in the direction for sewage of a heat exhanger tube of the tube core of a tubing body, and thereby, like invention concerning claim 2, in the case of the heat recovery from sewage, the recovery heating value can be secured, and, in the heat dissipation to sewage, the heat release can be secured greatly.
[0029] In addition, only the heat exhanger tube which sends out the heat carrier introduced from the end like the above-mentioned from the other end does not have the various constraint like a heat pipe, and since processing is also easy compared with a heat pipe, it is easy to attach a heat exhanger tube in the body for sewage of tubing by the tubing seriate voice of the juxtaposition prolonged in the direction of a tube core of the body for sewage of tubing, and the manufacture cost of tubing for sewage does not increase greatly especially according to this structure.
[0030] The gestalt which is the hoop direction of the body for sewage of tubing, and arranges **** of juxtaposition of a heat exhanger tube at equal intervals in order to attach a heat exhanger tube in the body for sewage of tubing by the tubing seriate voice of the juxtaposition prolonged in the direction of a tube core of the body for sewage of tubing, Or although any of the gestalt arranged in the accumulation condition to the specific part in the hoop direction of the body for sewage of tubing may be adopted From generally pouring sewage by non-flood condition, a sewage way the change in a sewage flow rate in such a case, from a certain thing When carrying out heat exchange of the sewage within the body for sewage of tubing after a facility, and the passage heat carrier in a heat exhanger tube efficiently Moreover, it is desirable to arrange **** of juxtaposition of a heat exhanger tube in the accumulation condition to the pars-basilaris-ossis-occipitalis part in the hoop direction of the body for sewage of tubing, when carrying out heat exchange stably in the condition with little effect by change of a sewage flow rate.
[0031] Moreover, about the thermal passage to the heat exhanger tube made into the tubing seriate voice of juxtaposition, any of the gestalt which makes juxtaposition pass a heat carrier to **** of juxtaposition, the gestalt which **** of juxtaposition is connected [gestalt] in the shape of meandering, and makes a serial pass a heat carrier to **** of juxtaposition, or the gestalt which combined these juxtaposition passage and serial passage again may be adopted.
[0032] [4] Make it the structure which distributed the end by-pass edge and other end by-pass edge of said heat exhanger tube to the end by-pass edge and other end by-pass edge of said body for sewage of tubing, and has arranged them in invention concerning claim 4 in implementation of invention concerning any 1 term of claims 1-3.
[0033] That is, the end by-pass edge of the heat exhanger tube attached in one body for sewage of tubing in case sequential connection of the bodies for sewage of tubing will be carried out in the planned facility site of a facility and a sewage way will be formed, if it is this structure, The other end by-pass edge of the heat exhanger tube attached in the body for sewage of another side of tubing It will be in the condition of being mutually located in near in the connection part of the bodies for these sewage of tubing, and these installation heat exhanger tubes can be connected well easily. By this When taking the facility gestalt which carries out series connection of the installation heat exhanger tubes of each body for sewage of tubing, construction of the sewage use heat-source facility can be made still easier.
[0034] [5] Make it the structure which has arranged mutually the end by-pass edge and other end by-pass edge of said

heat exhanger tube in the part soon in the direction of a tube core of said body for sewage of tubing in invention concerning claim 5 in implementation of invention concerning any 1 term of claims 1-3.
[0035] That is, connection of the supply by-pass (or discharge by-pass) of thermal feeding-and-discarding tubing to the end by-pass edge of that installation heat exhanger tube if it is this structure, in case thermal feeding-and-discarding tubing will be connected to the heat exhanger tube attached in the body for sewage of tubing in the planned facility site of a facility, Connection of the discharge by-pass (or supply by-pass) of thermal feeding-and-discarding tubing to the other end by-pass edge of the installation heat exhanger tube will be able to be made well easily mutually in a part soon. By this When taking the facility gestalt which connects the supply by-pass and discharge by-pass of thermal feeding-and-discarding tubing to the installation heat exhanger tube of each body for sewage of tubing, construction of the sewage use heat-source facility can be made still easier.
[0036] [6] Make it the structure which attached the joint in the tube end of said heat exhanger tube in invention concerning claim 6 in implementation of invention concerning any 1 term of claims 1-5.
[0037] That is, if it is this structure, in case it will connect thermal feeding-and-discarding tubing to the heat exhanger tube attached in the body of a sewer pipe in the planned facility site of a facility or the installation heat exhanger tubes of each body for sewage of tubing will be connected, these connection can be easily made well using the joint in which it is beforehand attached by the tube end of a heat exhanger tube, and construction of a sewage use heat-source facility can be made still easier at this point.
[0038] [7] Make it the structure using the plastic conduit which has flexibility in said heat exhanger tube in invention concerning claim 7 in implementation of invention concerning any 1 term of claims 1-6.
[0039] That is, if the plastic conduit which has flexibility is used for a heat exhanger tube, it can compare with using for a heat exhanger tube the metallic conduit which is ****, installation of the heat exhanger tube to the body for sewage of tubing in the condition of making the peripheral face of the body for sewage of tubing meeting can be made easy, and, thereby, manufacture cost of tubing for sewage can be made cheaper.
[0040] Moreover, since a plastic conduit is generally excellent in corrosion resistance, if a plastic conduit is used for the heat exhanger tube attached in the body for sewage of tubing, it can also raise further the durability of the sewage use heat-source facility to build.
[0041] [8] Make it the structure which attached the heat insulator which changes non-****** of said heat exhanger tube into a heat insulation condition to the exterior among the peripheral faces of said body for sewage of tubing in invention concerning claim 8 in implementation of invention concerning any 1 term of claims 1-7.
[0042] That is, the thing which sewage heat will diffuse outside from non-****** of a heat exhanger tube among that peripheral face in the body for sewage of tubing after a facility if it is this structure () By the case where recovery use is carried out, sewage potential heat Namely, external stripping of warm temperature, one side, In the case where sewage is used as a source of heat dissipation, external stripping of cold energy can be inhibited with the above-mentioned heat insulator, and the heat exchange effectiveness of the sewage within the body for sewage of tubing after the part and a facility and the passage heat carrier in a heat exhanger tube can be raised. By this In the case of the heat recovery from sewage, the recovery heating value can be secured, and, in the heat dissipation to sewage, the heat release can be secured still more greatly.
[0043] In addition, if it hits attaching the above-mentioned heat insulator, any of the gestalt which attaches a heat insulator only to non-****** of a heat exhanger tube among the peripheral faces of the body for sewage of tubing, or the gestalt which attaches heat insulators also including a heat exhanger tube's existence part in the condition of inserting a heat exhanger tube, between the peripheral face of the body for sewage of tubing and a heat insulator may be adopted.
[0044] [9] By invention concerning claim 9, in implementation of invention concerning any 1 term of claims 1-8, where said heat exhanger tube is located between the peripheral faces of said body for sewage of tubing, make the periphery section of said body for sewage of tubing into the structure which attached the wrap protective cover.
[0045] That is, the time of carrying the body for sewage furnished with a heat exhanger tube of tubing to the planned facility site of a facility, if it is this structure, In case the body for sewage of tubing is installed in a digging slotted hole in the planned facility site of a facility, it can prevent damaging an installation heat exhanger tube in the collision with other objects etc. with the above-mentioned protective cover. By this In that delay of construction by heat exhanger tube damage is avoidable, construction of a sewage use heat-source facility can be made still easier.
[0046] Moreover, degradation of the heat exhanger tube after facility construction can also be effectively prevented with the above-mentioned protective cover, and the durability of a sewage use heat-source facility can also be raised further.
[0047] In addition, when doubling and carrying out invention concerning claim 8 which attaches a heat insulator, by attaching a protective cover to the condition of locating a heat exhanger tube and a heat insulator between the peripheral face of the body for sewage of tubing, and a protective cover, protection of a heat insulator can also be doubled and aimed at, and it can have a heat insulator in coincidence, and the crater damage on a protective cover can

also be prevented.
[0048] [10] Make it the structure which enclosed the heat carrier with said heat exhanger tube in invention concerning claim 10 in implementation of invention concerning any 1 term of claims 1-9.
[0049] That is, if it is this structure, in case thermal feeding-and-discarding tubing and other heat exhanger tubes will be connected to the heat exhanger tube attached in the body of a sewer pipe and a heat carrier will be filled to these heat exhanger tubes in the planned facility site of a facility, by the heat carrier be beforehand enclosed with that heat exhanger tube, there is no needlessness, the activity which extracts the air in a heat exhanger tube can be simplified, and construction of a sewage use heat-source facility can be made still easier at this point.
[0050] In addition, the heat carrier enclosed with the heat exhanger tube may be a heat carrier of a different kind, as long as mixture with the heat carrier which a heat exhanger tube is made to pass behind the facility of a facility, and the passage [it does not necessarily need to be of the same kind, and] heat carrier after the facility of a facility is allowed.
[0051] Moreover, the bulb for thermal enclosure is attached in the tubing edge of a heat exhanger tube in implementation of invention concerning claim 10, and it is good to have aperture actuation of the bulb and to enable it to shift a heat exhanger tube to the free passage condition under thermal restoration with thermal feeding-and-discarding tubing and other heat exhanger tubes easily, after this connects a heat exhanger tube to thermal feeding-and-discarding tubing or other heat exhanger tubes in the planned facility site of a facility.
[0052] [11] Make it the structure which made the vacuum the inside of tubing of said heat exhanger tube in invention concerning claim 11 in implementation of invention concerning any 1 term of claims 1-9.
[0053] If it is this structure, in case thermal feeding-and-discarding tubing and other heat exhanger tubes will be connected to the heat exhanger tube attached in the body of a sewer pipe and a heat carrier will be filled to these heat exhanger tubes in the planned facility site of a facility, by that is, the thing beforehand done for the vacuum suction of the inside of tubing of that heat exhanger tube The activity which extracts the air in a heat exhanger tube can be done still easier for construction of a sewage use heat-source facility like unnecessary invention which is, can carry out, can simplify and relates to claim 10 at this point.
[0054] And since it is necessary to maintain the inside of tubing of a heat exhanger tube at a necessary degree of vacuum when taking the facility gestalt which makes a heat exhanger tube pass the refrigerant for evaporation of heat pump, and operates a heat exhanger tube as it as a refrigerant evaporator of heat pump, or to take the facility gestalt which makes a heat exhanger tube pass the refrigerant for condensation of heat pump, and operates a heat exhanger tube as it as a refrigerant condenser of heat pump, when taking such a facility gestalt, it becomes an effective means especially.
[0055] In addition, like invention which relates to claim 10 in implementation of invention concerning claim 11, the bulb for vacuum maintenance is attached in the tubing edge of a heat exhanger tube, and it is good to have aperture actuation of this bulb and to enable it to shift a heat exhanger tube to a free passage condition with thermal feeding-and-discarding tubing or other heat exhanger tubes easily, after this connects a heat exhanger tube to thermal feeding-and-discarding tubing or other heat exhanger tubes in the planned facility site of a facility.
[0056]
[Embodiment of the Invention] The [1st operation gestalt] Drawing 1 and drawing 2 show the tubing P for sewage used for construction of a sewage use heat-source facility. This tubing P for sewage It is made the structure which the peripheral face of the body 2 for sewage of tubing was made to meet in the condition of twisting spirally, and attached in the body 2 for sewage of tubing the heat exhanger tube 1 which sends out the heat carrier L introduced from the end from the other end. moreover, the condition of inserting a heat exhanger tube 1 into this body 2 for sewage of tubing between that peripheral face -- a heat exhanger tube's 1 existence part -- including -- the heat insulator 3 of the peripheral face of the body 2 for sewage of tubing which covers the whole mostly -- and the condition of having located the heat exhanger tube 1 and the heat insulator 3 between the peripheral faces of the body 2 for sewage of tubing -- the periphery section of the body 2 for sewage of tubing -- the wrap protective cover 4 is mostly attached for the whole.
[0057] End by-pass edge 1a of a heat exhanger tube 1 and other end by-pass edge 1b Distribute to the end by-pass edge and other end by-pass edge of the body 2 for sewage of tubing, arrange, and it is made to have extended to the exterior of a protective cover 4. Moreover, after attaching the joint 5 and the bulb 6 for thermal enclosure in both the tube ends 1a and 1b of a heat exhanger tube 1 and being filled up with a heat carrier L in tubing of a heat exhanger tube 1, the heat carrier L is enclosed in tubing of a heat exhanger tube 1 with the lock out by this bulb 6.
[0058] In addition, 1c is a fastener which attaches a heat exhanger tube 1 in the body 2 for sewage of tubing.
[0059] Drawing 3 shows the thaw facility built using the above-mentioned tubing P for sewage, ships the body 2 for sewage of tubing which attached the heat exhanger tube 1 beforehand like the above about construction of this thaw facility to the planned facility site of a facility, and forms a sewage way M in sewage way facilities in that planned facility site by carrying out sequential connection of the body 2 for sewage of tubing within the slotted hole 7 which carried out digging formation.

[0060] Moreover, end by-pass edge 1a of the heat exhanger tube 1 attached in one body 2 for sewage of tubing in the connection part of body of tubing 2 for sewage, Installation heat exhanger tube 1 of body of tubing 2 each for sewage are connected to a serial by connecting using the joint 5 of the attachment of other end by-pass edge 1b of the heat exhanger tube 1 attached in the body 2 for sewage of another side of tubing to these tube ends 1a and 1b.
[0061] And heat exhanger tube tube-end 1a by the side of the end in the series connection group of these heat exhanger tubes 1 and heat exhanger tube tube-end 1b by the side of the other end again While connecting with outward tube 9a and **** 9b of the thermal circuit 9 to the heat exchanger 8 for thaws installed in the bottom of road surfaces, such as a road and a parking lot, at each ** using the joint 5 of the attachment to these tube ends 1a and 1b The bulb 6 for thermal enclosure of the tube ends 1a and 1b in the installation heat exhanger tube 1 of body of tubing 2 each for sewage is opened, to each heat exhanger tube 1 and a list, outward tube 9a and **** 9b of the thermal circuit 9 are changed into the free passage condition under thermal restoration, and a slotted hole 7 is returned in the condition.
[0062] 2' is the usual tubing for sewage (namely, body for sewage of tubing which has not attached the heat exhanger tube 1) which forms the sewage way M with the above-mentioned body 2 for sewage furnished with a heat exhanger tube 1 of tubing.
[0063] In this thaw facility, that is, by circulating a heat carrier L (for example, brine) with a circulating pump 10 through the thermal circuit 9 (namely, thermal feeding-and-discarding tubing to a heat exhanger tube 1) between the series-connection group of a heat exhanger tube 1, and the heat exchanger 8 for thaws Carry out heat exchange of that heat carrier L to the sewage W of the sewage way M through the tube wall of a heat exhanger tube 1, and the tube wall of the body 2 for sewage of tubing in the tubing secret communication fault process of each heat exhanger tube 1, thermal circulation is made to radiate heat by the heat exchanger 8 for thaws with the sewage potential heat collected to the heat carrier L by this heat exchange, and the thaw of a road or a parking lot is performed.
[0064] In addition, although the **** 1 operation gestalt showed the example which circulates a heat carrier L between the heat exchanger 8 for thaws, and a heat exhanger tube 1 A heat carrier L is circulated with the same facility configuration between the load heat exchangers for road surface anti-freeze etc., and a heat exhanger tube 1. The recovery heat from Sewage W may be made to perform anti-freeze, and a heat carrier L is circulated between the load heat exchanger for cooling, and a heat exhanger tube 1 with the same facility configuration, and it may be made to perform various cooling with the gestalt which uses Sewage W for the source of heat dissipation in a load heat exchanger.
[0065] The [2nd operation gestalt] The point of drawing 4 showing the heat pump facility built using the above-mentioned tubing P for sewage shown in drawing 1 and drawing 2 , sending the body 2 for sewage of tubing which attached the heat exhanger tube 1 beforehand to the planned facility site of a facility, and building a facility is the same as the 1st operation gestalt.
[0066] 11 is compression equation heat pump, and this heat pump 11 is equipped with the heat pump circuit (frozen circuit) which uses the heat-source side heat exchanger 12, the load side heat exchanger 13, a compressor 14, an expansion valve 15, and a four way valve 16 as main components, and performs a switch with warm temperature generating operation and cold energy generating operation by switch of the refrigerant path by the four way valve 16.
[0067] That is, by switch of the refrigerant path by the four way valve 16, by warm temperature generating operation, the heat-source side heat exchanger 12 is operated as a refrigerant evaporator, and the load side heat exchanger 13 is operated as a refrigerant condenser. Moreover, in cold energy generating operation, conversely, the heat-source side heat exchanger 12 is operated as a refrigerant condenser, and the load side heat exchanger 13 is operated as a refrigerant evaporator.
[0068] 17 is a thermal circuit () by the side of the heat source which circulates the heat-source side heat carrier L with a circulating pump 18 between the heat-source side heat exchanger 12 of heat pump 11, and the series connection group of a heat exhanger tube 1. It is thermal feeding-and-discarding tubing to a heat exhanger tube 1. Namely, in this heat pump facility At the time of that construction, it connects with each ** using the joint 5 of beforehand the attachment of heat exhanger tube tube-end 1a by the side of the end in the series connection group of a heat exhanger tube 1, and heat exhanger tube tube-end 1b by the side of the other end to these tube ends 1a and 1b to outward tube 17a and **** 17b of this thermal circuit 17.
[0069] On the other hand, 19 is a thermal circuit by the side of the load made to circulate through load side heat carrier L' with a circulating pump 21 between the load side heat exchanger 13 of heat pump 11, and load equipment 20.
[0070] In this heat pump facility, that is, by performing warm temperature generating operation of heat pump 11 at a warm temperature need term (especially winter) With the gestalt which carries out the endoergic operation of the heat-source side heat exchanger 12 (namely, endoergic side heat exchanger in warm temperature generating operation) as a refrigerant evaporator to the heat-source side heat carrier L which collected sewage potential heat by heat exchange with the sewage W in the tubing secret communication fault process of a heat exhanger tube 1 Warm temperature is generated in the load side heat exchanger 13 (namely, heat dissipation side heat exchanger in warm temperature generating operation) as a refrigerant condenser, and this generating warm temperature is supplied to load equipment

20 with circulation of load side heat carrier L'.
[0071] Moreover, by performing cold energy generating operation of heat pump 11 at a cold energy need term (especially summer) With the gestalt which carries out the heat dissipation operation of the heat-source side heat exchanger 12 (namely, heat dissipation side heat exchanger in cold energy generating operation) as a refrigerant condenser to the heat-source side heat carrier L which radiated heat with Sewage W by heat exchange with the sewage W in the tubing secret communication fault process of a heat exhanger tube 1 Cold energy is generated in the load side heat exchanger 13 (namely, endoergic side heat exchanger in cold energy generating operation) as a refrigerant evaporator, and this generating cold energy is supplied to load equipment 20 with circulation of load side heat carrier L'.
[0072] In addition, although the **** 2 operation gestalt showed the heat pump facility which performs alternatively heat recovery from Sewage W, and heat dissipation to Sewage W by switch with warm temperature generating operation of heat pump 11 and cold energy generating operation It is made to circulate a heat carrier L between the endoergic side heat exchanger of the heat pump which performs only warm temperature generating operation, and a heat exhanger tube 1. The heat pump facility which performs only heat recovery from Sewage W may be built, and conversely, as a heat carrier L is circulated between the heat dissipation side heat exchanger of the heat pump which performs only cold energy generating operation, and a heat exhanger tube 1, the heat pump facility which performs only heat dissipation to Sewage W may be built.
[0073] The [3rd operation gestalt] Drawing 5 and drawing 6 show tubing P' for sewage for sewage use heat-source facility construction which carried out the partial change of the structure. In this tubing for sewage P' A heat exhanger tube 1 is made to meet the peripheral face of the body 2 for sewage of tubing by the tubing seriate voice of the juxtaposition prolonged in the direction of a tube core of the body 2 for sewage of tubing, it attaches in the body 2 for sewage of tubing, and the same heat insulator 3 and same protective cover 4 as the above-mentioned are attached to the body 2 for sewage of tubing on it.
[0074] End by-pass edge 1a of a heat exhanger tube 1 and other end by-pass edge 1b In the direction of a tube core of the body 2 for sewage of tubing, will arrange in a part mutually soon, and it will be made to have extended to the exterior of a protective cover 4. Moreover, after attaching bulb 6' a joint 5 and for vacuum maintenance in both the tube ends 1a and 1b of a heat exhanger tube 1 and carrying out vacuum suction of the inside of tubing of a heat exhanger tube 1, the inside of tubing of a heat exhanger tube 1 is maintained at the vacua with the lock out by this bulb 6'.
[0075] In addition, it connects in the shape of meandering, and a serial is passed, and the heat exhanger tube 1 made into **** of juxtaposition makes pass it and makes a heat carrier L it.
[0076] Drawing 7 shows the heat pump facility built using above-mentioned tubing P' for sewage. About construction of this heat pump facility Ship the body 2 for sewage of tubing which attached the heat exhanger tube 1 beforehand like the above to the planned facility site of a facility like the 1st and 2nd operation gestalt, and to sewage way facilities in the planned facility site within the slotted hole 7 which carried out digging formation The sewage way M is formed by connecting the body 2 for sewage of tubing which has attached the heat exhanger tube 1 beforehand with other usual tubing 2' for sewage (body for sewage of tubing which has not attached the heat exhanger tube 1).
[0077] Moreover, end by-pass edge 1a of the heat exhanger tube 1 attached in the body 2 for sewage of tubing and other end by-pass edge 1b To outward tube 23a and **** 23b of the refrigerant circuit 23 (namely, thermal feeding-and-discarding tubing to a heat exhanger tube 1) which extended from the below-mentioned heat pump 22 It connects with these tube ends 1a and 1b using the joint 5 of an attachment. After that, Bulb 6' for vacuum maintenance of the tube ends 1a and 1b in the installation heat exhanger tube 1 is opened, to a heat exhanger tube 1 and a list, outward tube 23a and **** 23b of the refrigerant circuit 23 are changed into the free passage condition of a degree of vacuum of having been suitable for refrigerant actuation, and a slotted hole 7 is returned in the condition.
[0078] Heat pump 22 is what constitutes a heat pump circuit (frozen circuit) by using the installation heat exhanger tube 1 of the body 2 for sewage of tubing, the load side heat exchanger 24, a compressor 25, an expansion valve 26, and a four way valve 27 as main components. Warm temperature generating operation as which the installation heat exhanger tube 1 of the body 2 for sewage of tubing is operated as a refrigerant evaporator, and the load side heat exchanger 24 is operated as a refrigerant condenser by switch of the refrigerant path by the four way valve 27, A switch with cold energy generating operation as which the installation heat exhanger tube 1 of the body 2 for sewage of tubing is operated as a refrigerant condenser, and the load side heat exchanger 24 is operated as a refrigerant evaporator contrary to this is performed.
[0079] 28 is a thermal circuit by the side of the load made to circulate through load side heat carrier L' with a circulating pump 30 between the load side heat exchanger 24 of heat pump 22, and load equipment 29.
[0080] In this heat pump facility, that is, by performing warm temperature generating operation of heat pump 22 at a warm temperature need term (especially winter) Heat pump operation of the gestalt which is made to carry out heat exchange of the refrigerant R for evaporation in heat pump 22 (namely, refrigerant which passed the expansion valve 26) to the sewage W of the sewage way M in the tubing secret communication fault process of a heat exhanger tube 1,

and is evaporated by the deprivation of sewage potential heat is carried out. Warm temperature is generated by the load side heat exchanger 24 as a refrigerant condenser in this operation, and that generating warm temperature is supplied to load equipment 29 by circulation of load side heat carrier L'.

[0081] Moreover, by performing cold energy generating operation of heat pump 22 at a cold energy need term (especially summer) Heat pump operation of the gestalt which is made to carry out heat exchange of the refrigerant R for condensation of heat pump 22 (namely, regurgitation refrigerant of a compressor 25) to the sewage W of the sewage way M in the tubing secret communication fault process of a heat exhanger tube 1, and is made to condense by heat dissipation to Sewage W is carried out. Cold energy is generated by the load side heat exchanger 24 as a refrigerant evaporator in this operation, and that generating cold energy is supplied to load equipment 29 by circulation of load side heat carrier L'.

[0082] In addition, although **** of juxtaposition of a heat exhanger tube 1 was made into the structure equally made distribution to the hoop direction of the body 2 for sewage of tubing in tubing for sewage P' of a **** 3 operation gestalt As it replaces with this and is shown in drawing 8 , it may be made to carry out accumulation arrangement of the **** of juxtaposition of a heat exhanger tube 1 at the pars-basilaris-ossis-occipitalis side of the body 2 for sewage of tubing. Moreover, it may be made to replace with a serial passing a heat carrier (refrigerant R) to the heat exhanger tube 1 made into **** of juxtaposition, and you may make it the structure of making juxtaposition passing a heat carrier (refrigerant R) to **** of juxtaposition of a heat exhanger tube 1.

[0083] Moreover, although the **** 3 operation gestalt showed the heat pump facility which performs alternatively heat recovery from Sewage W, and heat dissipation to Sewage W by switch with warm temperature generating operation of heat pump 22 and cold energy generating operation like the 2nd operation gestalt It is made to make a heat exhanger tube 1 pass the refrigerant R for evaporation of the heat pump which performs only warm temperature generating operation. The heat pump facility which performs only heat recovery from Sewage W may be built, and conversely, as a heat exhanger tube 1 is made to pass the refrigerant R for condensation of the heat pump which performs only cold energy generating operation, the heat pump facility which performs only heat dissipation to Sewage W may be built.

[0084] [Another operation gestalt] Next, another operation gestalt is listed.

[0085] Various installation means are [installation by the fastener, and installation by welding] employable as installation of the heat exhanger tube 1 to the body 2 for sewage of tubing at first.

[0086] Circular, an ellipse, a rectangle, etc. may be what kind of configurations, and the cross-section configuration of a heat exhanger tube 1 may make them the structure made to be equipped with the piece section for securing greatly a heating area with the body 2 for sewage of tubing.

[0087] Although the thing of the various quality of the materials, such as a metallic conduit and a plastic conduit, can be used for a heat exhanger tube 1, if the plastic conduit which has flexibility is used for a heat exhanger tube 1, installation of the heat exhanger tube 1 to the body 2 for sewage of tubing can be made easy.

[0088] The sewage use heat-source facilities built using tubing for sewage of this invention may be any of a facility aiming at the heat recovery from sewage, or a facility aiming at the heat dissipation to sewage, and the application of the recovery heat in the case of aiming at the heat recovery from sewage and the purpose of heat dissipation in the case of aiming at the heat dissipation to sewage may also be what kind of things, respectively.

[Translation done.]

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